

## Math 075 - 6.2 Solving Linear Equations

First some definitions...

**Definition** In general terms, a linear equation in one variable is an equation containing one variable to the first power (the linear part). It's general form can be written as:

$$ax + b = c \text{ where } a, b, c \text{ are real numbers and } a \neq 0$$

**Definition** LCD - least common denominator. The LCD is the smallest multiple of all denominators.

**Example** Assume your denominators are 4 and 8. Then the LCD would be 8, since 8 is the smallest multiple of 4 and 8.

**Example** Assume your denominators are 4 and 6. Then the LCD would be 12, since 12 is the smallest multiple of 4 and 6.

**Definition** In general terms, a linear equation in one variable is an equation containing one variable to the first power (the linear part).

It's general form can be written as:  $ax + b = c$  where  $a, b, c$  are real numbers and  $a \neq 0$

**General strategy to solve linear equations in one variable:** get all variable terms on one side and numbers on the other and then isolate the variable.

Possible techniques involved:

- Distribute to remove any parentheses.
- Simplify by combining like terms.
- If fractions in equation, multiply by LCD.

### Example

$$\text{Solve } 2(x - 5) = 3x - 6$$

$$\text{Distribute LHS: } 2x - 10 = 3x - 6$$

$$\text{Bring all variable terms to one side and constants to the other: } 2x - 3x = -6 + 10$$

$$\text{Simplify: } -x = 4$$

$$\text{Isolate } x \text{ by multiplying both sides by } -1: x = -4$$

### Example with fractions

Solve  $\frac{x}{4} + \frac{3}{4} = 2$ .

To clear the equation of fractions multiply both sides by the LCD:

$$4\left(\frac{x}{4} + \frac{3}{4}\right) = 2 \cdot 4$$

On LHS (left-hand side), distribute the 4 and evaluate RHS (right-hand side):

$$4 \cdot \frac{x}{4} + 4 \cdot \frac{3}{4} = 8$$

Cancel:

$$\cancel{4} \cdot \frac{x}{\cancel{4}} + \cancel{4} \cdot \frac{3}{\cancel{4}} = 8$$

$$x + 3 = 8$$

Isolate  $x$ :  $x = 5$

1. What is the difference between an expression and an equation?

2. What does it mean to be a solution to an equation?

3. How would you check your answer?

4. Given there is a solution, how would you graph your solution?



b) Solve the problem by dividing both sides by 5 first.

c) Which way was did you find easier?

11. Solve for the unknown. Also, check each answer.

a)  $6x - 4 = -2x - 10$

d)  $2x - 4 = 8(x - 3)$

b)  $2(4x + 1) = -12$

e)  $-3x + 15 = 3x - 15$

c)  $2x = 0$

f)  $5x - 5 = 2(1 - x) + 3x - 7$

12. Consider  $\frac{7}{8}x + \frac{1}{4} = 2x$ .

a) Solve by first multiplying both sides by the LCD.

b) Solve without clearing the fractions first.

c) Which way did you find easier?

13. Solve.

a)  $\frac{3}{2}x = 5$

b)  $4 = \frac{x}{2}$

$$\text{c) } \frac{1}{24} = \frac{1}{8}w$$

$$\text{e) } \frac{2}{9}x - \frac{1}{3} = 1$$

$$\text{d) } \frac{3(y+3)}{5} = 2y+6$$

$$\text{f) } \frac{1}{4} = \frac{x}{16}$$

$$\text{g) } \frac{x}{5} = \frac{x}{3} - 2$$